ROCKETS THREE ACT TASK

Big Idea: Computational fluency and flexibility with numbers extend to operations with larger (multi-digit numbers).

Curricular Competencies:

Although students will demonstrate many of these competencies during the three acts, when thinking about the learning you decide to focus on, it is recommended that you select one competency to look closely at. For example, in term one many teachers focus on communicating; therefore, for this three act task teachers may decide to place emphasis on looking at how students are able to represent their mathematical ideas in concrete, pictorial, and symbolic forms.

Reasoning and Analyzing
- *use reasoning to explore and make connections*
- *estimating reasonably*
- *developing mental math strategies and abilities to make sense of quantities*
- *model mathematics in contextualized experiences and explore the utility of mathematics as a tool for solving real-life problems*

Understanding and Solving
- *visualizing to explore mathematical concepts*
- *develop, demonstrate and apply mathematical understanding through play, inquiry and problem solving.*
- *develop and use multiple strategies to engage in problem solving*

Communicating and Representing
- communicate mathematical thinking in many ways
- explain and justify
- represent mathematical ideas in concrete, pictorial, and symbolic forms

Connecting and Reflecting
- reflect on mathematical thinking
- connect mathematical concepts to each other

Content: Multiplication of two-digit numbers by two-digit numbers.

ACT ONE:

What did you notice?	What do you wonder?

FOCUS QUESTION:

How many individual rocket candies are in the bag?

Estimating:

A too low estimate:	A too high estimate:

ACT TWO:

What else do you need to know to answer the question? What information would you like to have?

15 candies/per roll
90 rolls

Provide students with materials they can use to model the problem. These could include:
- base ten blocks, ten-frames, cuisenaire rods
- Graphing paper with highlighters (arrays)
- iPads with www.mathlearningcenter.org apps – partial products
- paper and pencils

ANTICIPATING STUDENT THINKING:
Make note of who uses which strategy and take pictures or video so that these can be shared with the class as a whole. Please note that students may represent these strategies concretely using materials, representationally through pictures (arrays and open arrays), or abstractly through numbers and symbols on paper.

Some sample STRATEGIES that students might use:

- o Who used **repeated addition or other addition strategies such as adding tens and adding ones?**

- o Who **broke a factor into two or more addends (Also known as Partial Products or the Distributive property)?**

> e.g., 90 x 16 =
> 90 x (10 + 6) =
> (90 x 10) + (90 x 6) =
> 900 + 540 = 1140

10   5

90
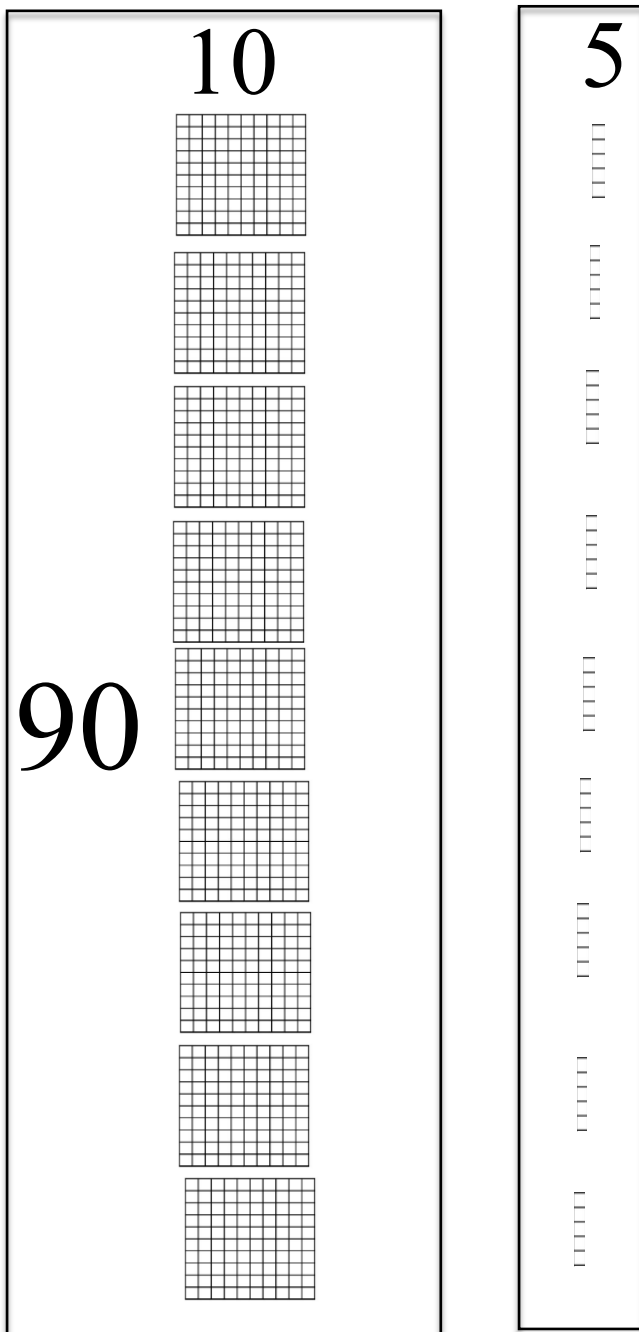
Note:

Just because a student decides to represent their thinking concretely, does not mean the strategy used is not sophisticated – hence, this example. Focus on the strategies, not just the materials/models they use to communicate their thinking.

$90 \times 15 =$
$90 \times (10 + 5) =$
$(90 \times 10) + (90 \times 5) =$
$900 + 450 =$

- o Who **rounded a factor and adjusted (also known as Making a Landmark or Friendly Number)**?

        e.g., 90 x 15 =
                I know I can add 5 to 15 to get 20 so I will multiply 90 x 20 =
                I know that equals 1800
                Then, I must adjust for what I added by taking away
                5 x 90 = 450
                1800 – 450 = 1350

                OR

                90 x 15 =
                I know if I add 10 to 90 I get 100 so I will multiply 100 x 15 =
                I know that equals 1500
                Then, I must adjust for what I added by taking away
                10 x 15 = 150
                1500 – 150 = 1350

ACT THREE:

Gather the students as a whole class and share photos and videos taken via the projector with the class. Ask students to orally explain the strategies they used. Determine which strategies you want to highlight and/or compare.

Sharing
- Build a class anchor chart with the different strategies students used.

REVEAL the answer!

Guiding questions for the teacher to consider:
- How are students engaging in the problem solving?
- What do they notice? What do they wonder?
- Are the students able to ask questions?
- Once the students engage with problem, are they able to mathematically model the situation?

- o What tools/model to they select to represent the question? (e.g. concrete materials like base ten blocks or ten frames, pencil and paper)
  - o Can they represent their concrete models pictorially?
  - o Are they able to connect numbers and symbols to their representations?
- Are the students able to orally explain their thinking? Are they sharing ideas with their peers?
- When different strategies have been shared, are students able to make connections between similar strategies and the representations used?

Summarize the learning:

Self-Reflection:
Strengths: What worked (What strategies did you use to work toward a solution)?
Stretches: What was difficult?
Next steps: What would you do differently next time? Was anyone inspired by someone else's strategy?

Moving Forward:
Continue to explore different opportunities to multiply two-digit numbers by two-digit numbers.